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ABSTRACT

This paper investigates the plausibility of various projections of academic demand for doctorates over the next two decades. Contributions to this demand by different sectors of higher education are examined and policy implications relevant for various decisionmakers involved in higher education are suggested. A data source bibliography used in calculating student faculty ratios is included. (MJM)

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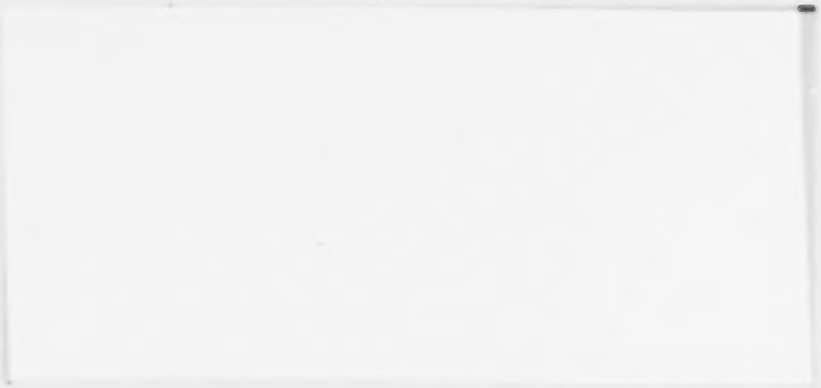

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ACADEMIC DEMAND FOR NEW PH.D.'S, 1970-90: ITS SENSITIVITY TO ALTERNATIVE POLICIES

F. E. Balderston

Roy Radner

Paper P-26

December, 1971

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PREFACE

This is one of a continuing series of reports of the Ford Foundation sponsored Research Program in University Administration at the University of California, Berkeley. The guiding purpose of this Program is to undertake quantitative research which will assist university administrators and other individuals seriously concerned with the management of university systems both to understand the basic functions of their complex systems and to utilize effectively the tools of modern management in the allocation of educational resources.

This paper investigates the plausibility of various projections of academic demand for doctorates over the next two decades. We examine the contributions to this demand by different sectors of higher education and then offer some policy implications relevant for various decision-makers involved in higher education.

The authors gratefully acknowledge the substantial research and programming assistance of Sharon C. Bush of the Ford Foundation Program for Research in University Administration, University of California.

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I. INTRODUCTION AND SUMMARY

The future supply and demand for holders of doctoral degrees is of increasing concern to national- and state-level policy makers, colleges and universities, and individuals who are present or future doctorates. The current recession in doctoral employment markets has inflicted frustration on many recent doctorates who could not find jobs appropriate to their training and has aroused anxieties about the future among present graduate students and their teachers. Allan Cartter, in his December, 1970 paper[1] to the American Association for the Advancement of Science, drew upon and updated previous work to support the view that there is nothing temporary about this: that, indeed, the accelerating production of doctorates will likely confront a constant and then a declining academic demand for them in the years ahead, throwing an increasing number and proportion of new doctorates into competition for other types of employment.

We shall not deal at all in this paper with the question of supply nor shall we investigate prospects for employment of new doctorates in industrial and governmental research and professional work, as distinct from faculty appointment in colleges and universities. We shall, however, test in some detail the plausibility of recent projections of academic demand for new doctorates, examine the possible contributions to this demand by each major sector of American higher education, and seek to illumine some positive policy choices in the financing and staffing standards of higher education. These choices have significant implications for the number of new doctorates who will find jobs in colleges and universities.

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[1] Published in slightly revised form in Science, 172 (1971).

The method used is quantitative projection of the number of new doctorates hired in faculty positions under each of a series of different policy assumptions. These assumptions work in combination. The approach does not, in itself, yield a forecast of future academic hiring demand, although Cartter used it for this purpose by adopting a set of what he felt were "best case" behavioral assumptions. Cartter's projections may themselves stimulate actions that vitiate their accuracy as forecasts--and indeed, Cartter expresses the hope that the supply of new doctorates will be reduced by actions taken in response to the plausible picture of the future that he describes.

Dael Wolfle and Charles V. Kidd, in "The Future Market for Ph.D.'s,"[2] summarized and interpreted a great deal of recent work on both supply projections and demand analysis. Their discussion drew on documents and comments from an informal conference held on April 2, 1971, in Washington, D.C. The findings we present and discuss below in their completed form were reported in part at that meeting.

As a point of departure for this study of academic hiring demand for new doctorates from 1970-90, it is useful first to summarize Cartter's approach and conclusions.

Cartter in a Nutshell

The essence of Allan Cartter's paper is that the academic job market for new Ph.D.'s can be expected to absorb annually only eight to ten thousand new doctorates until the early 1980's, after which the net demand for new doctorates in academic positions will go negative, while the

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[2] Science, 173 (August 27, 1971), pp. 784-793.

projected production rate of new doctorates is on a sharply rising trend, already above 30,000 per year and expected to reach about 68,000 per year by 1980, according to National Research Council projections, or to about 48,000 per year in 1980, according to Cartter's own most recent and more conservative projections. Historically, about half the new doctorates in all fields have gone into college and university teaching posts, so the predicted situation is that other types of occupations will have to absorb a far larger fraction of new doctorates in the future than they have in the past.

The Critical Assumptions Underlying Cartter's Estimates and the Method of Estimation

Cartter built up his estimate of the annual number of new doctorates for whom academic jobs would be available by:

1) constructing an estimate of each year's total FTE enrollment from figures on the U.S. population 18-24 age group and an assumed slow rise in the percentage of those who will enter post-secondary studies (and, implicitly, an assumption about the duration of stay in college of those in the 18-24 year population who are assumed to begin);

2) assuming an incremental U.S. full-time-equivalent-student-full-time faculty ratio (25:1) drawn from judgments about the pattern of the late 1960's, and using this to compute the number of full-time faculty required for the projected enrollment increases;

3) obtaining the total increment of number of faculty to be hired by adding to the increase of numbers a percentage of total faculty representing mortality, retirement, and a small net out-migration to non-academic employment sectors from faculty ranks (the total assumed to be 2% per year); and

4) applying to the total number of faculty to be hired, a percentage estimate of those who will need to be hired with doctoral training (the average over all sectors of higher education assumed to be 44%).

Radner-Balderston Disaggregated Projections Based on Assumptions Analogous to Cartter's

Since enrollment growth forecasts, student-faculty ratios, and percentage of faculty with doctoral training vary enormously among the different sectors of higher education, we made disaggregated projections utilizing the above variables for each of the six sectors of higher education: public universities, private universities, public four-year colleges, private four-year colleges, public two-year colleges and private two-year colleges. The method of calculation is fully described in Section III. The aggregate total from our sectoral analysis can be compared with Cartter's projections as follows:

1a) Enrollment: We used Cartter's aggregate enrollment series; however, it was also necessary to take the aggregate enrollment projection for each year and distribute it by some reasonable assumption over the six sectors. Tentative and judgmental estimates distributing various fractions of the expected increment from 1969 on, developed by the Carnegie Commission staff, were used to disaggregate the total enrollment series.

2a) Student-Faculty Ratio: We calculated an average full-time-equivalent-student-full-time-equivalent faculty ratio for each of the six sectors from 1967 U.S. Office of Education data; the weighted average of these six ratios is 17.3:1. This differs from Cartter's figure in that he used the number of full-time-faculty, not full-time-equivalent faculty, in calculating the ratio.

3a) Rate of Death, Retirement, and Net Out-Migration: The 2% figure that Cartter used was assumed to be constant over the six sectors analyzed; and

4a) Percentage of New Hires having Doctoral-Level Training: Cartter used the figure of 44% for his projections, assuming that enough new faculty would be hired with the Ph.D. to just maintain this percentage throughout the next twenty years; however, our projections utilized sectoral percent-of-doctorate parameters from 1967 Office of Education data, and their weighted average was calculated to be 35.7%.

The above assumptions (1a) - (4a) employed in the sectoral analysis comprise our "No Change" model. Cartter's own projections are about 10% higher than our "No Change" case in predicting total hiring demand for new faculty at the doctoral level, for the period 1970-1990; Cartter estimates a demand of 123,300 while our "No Change" model predicts that 111,500 new faculty with doctorates will be required. Figure 1-1 compares these two projections. The U.S. faculty population is large--approximately 375,000 FTE positions in 1970--and the potential number of years of service of each faculty member from the beginning of full-time teaching until death or retirement may be thirty years or more. Stock-flow situations of this kind often show high variations of the flow requirements when modest changes of assumptions are made.

The Importance of Student-Faculty Ratios

Cartter's projection depends critically upon the student-faculty ratio [Assumption (2) above]. In Section II of this paper, we have therefore summarized and updated previous work of Radner and Miller[3] on student-faculty ratios in U.S. higher education. That section also includes

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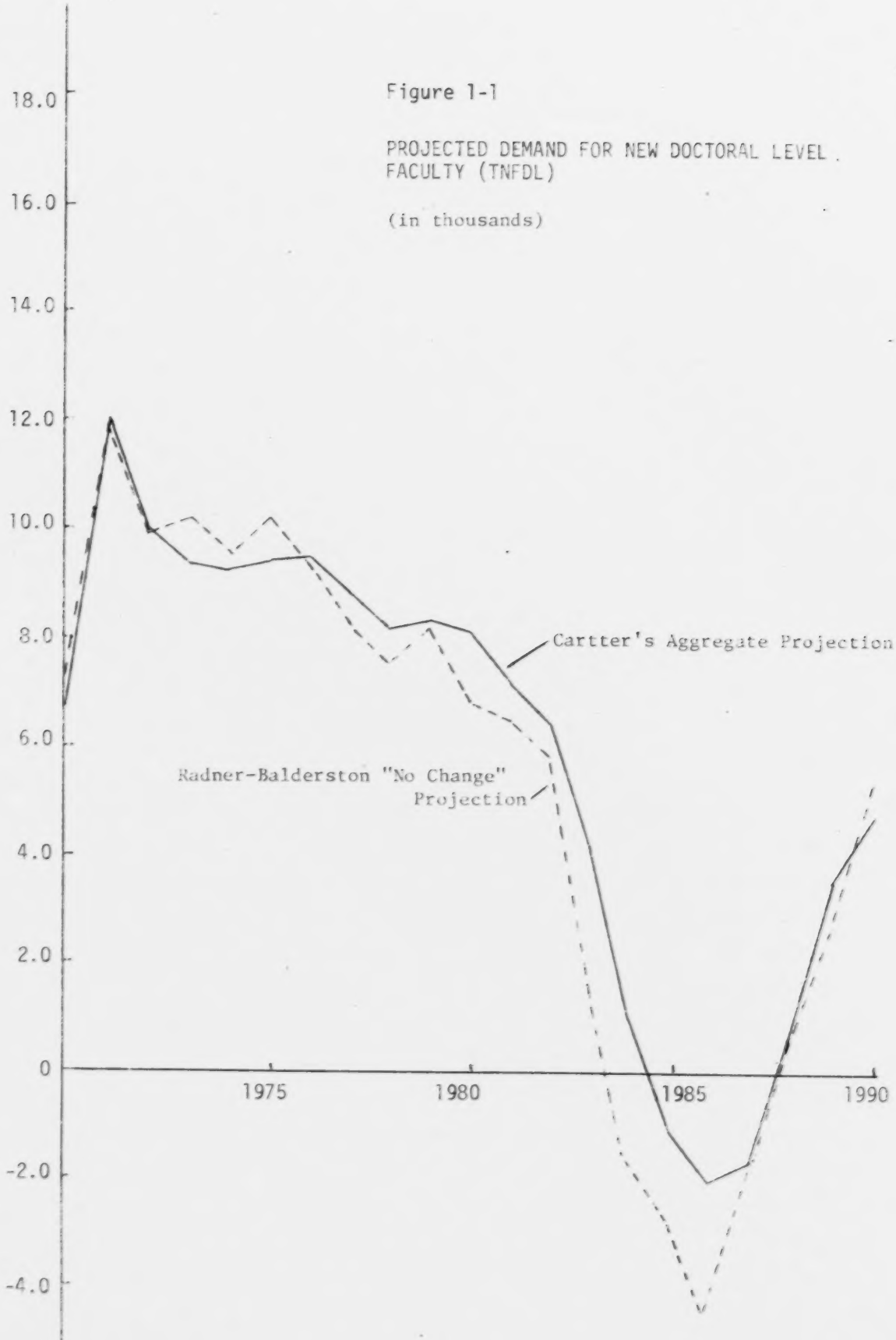
[3]Radner, R. and L. S. Miller, "Demand and Supply in U.S. Higher Education: A Progress Report," American Economic Review, 60, (May 1970), pp. 326-334.

Figure 1-1

PROJECTED DEMAND FOR NEW DOCTORAL LEVEL FACULTY (TNFDL)

(in thousands)



evidence concerning the recent history of the student-faculty ratio in each of six major sectors of U.S. higher education, to be used in making our disaggregated projections.

Alternative Assumptions

Cartter's method of projection is multiplicative; hence a change in any one assumption, and even more, a change in two or more assumptions at the same time, may have substantial effects on the number of new doctorates hired for academic work each year.

In order to test the sensitivity of Cartter's projections to each of the assumptions and also to show the impacts on academic hiring of doctorates if new policy standards are adopted by government and institutional decision-makers, we therefore employed departures from each of the assumptions used in our "No Change" projections. These and other projections are fully described in Section III of this paper. Some of the alternative assumptions we considered are:

1b) Enrollment: As an alternative to Cartter's series, we used U.S. enrollment projections recently made by Professor Gus Haggstrom of the Carnegie Commission staff. These enrollments are a bit higher for each year than Cartter's--in 1980, for example, 891,000 or about 9% above Cartter's. Haggstrom's projections also do not show the steep fall in enrollments in the 1980's that Cartter's enrollment series does.

2b) Student-Faculty Ratio: We utilized the fact that student-faculty ratios have been increasing throughout the 1950's and 1960's in the various segments of U.S. higher education to pose the question: what if it were considered desirable, and the money were found, to permit the weighted average student-faculty ratio of 17.3:1 in 1967 to be reduced in regular annual decrements to a

weighted average over all sectors of 15.4:1 in 1990?

3b) Rate of Death, Retirement and Net Out-Migration: Remains the same (2%) as "No Change" case.

4b) Percentage of New Hires having Doctoral-Level Training: Cartter assumed that enough new faculty would be hired with the Ph.D. to just maintain, throughout the next twenty years, the 1970 percentage of Ph.D.'s. However, if it is socially desirable to up-grade the level of training of new faculty, the 1967 overall percentage might be incremented to a weighted average of 65% by 1990.

In brief, the combined effect of Assumptions (1b) - (4b) is very substantial--for the year 1980, about 115% more new doctorates would be needed for academic positions than under our "No Change" projection.

Sensitivity Analysis of Alternative Projections

Recalculating our "No Change" projection of demand for new doctoral level faculty, with only the change in the student-faculty ratio assumption [Assumption (2b) instead of Assumption (2a)], produced about a 17% increase in the annual number of new faculty doctoral positions through the 1970's, and its effect is also to lessen the trough of negative demand years in the "No Change" projection during the early 1980's.

The Haggstrom enrollment series [Assumption (1b)] also produces by itself a 17% increase in annual demand for new doctoral faculty through the 1970's, and it also eliminates the period of negative demand in the 1980's.

The change in Assumption (4b)--the percentage of new faculty hired at the doctoral level--increases the demand for new doctorates by about 30% through the 1970's; however, it also creates an even deeper trough of negative demand for doctorates during the 1980's.

Sector-by-Sector Hiring Demand for New Doctorates

In Section IV, the sector-by-sector demand for new faculty with the doctorate is examined and interpreted. A sectoral analysis based on the Cartter enrollment projection, and on unchanging sectoral student-faculty ratios and doctoral hiring proportions, shows that the public universities' contribution to doctoral hiring demand remains slightly above one-third of total doctoral hiring into academic positions. Because private universities are thought to have low prospective enrollment growth, their share of demand for doctorates falls from 11% in 1970 to 4% in 1980. Public four-year colleges, with expected rapid enrollment increases, rise from 30% of the total in 1970 to 37% in 1980, whereas private four-year colleges decline slightly to 14% in 1980.

Public two-year colleges rise slightly in their hiring demand for new doctorates--from 4% in 1970 to 6% in 1980. Private two-year colleges are a tiny and static market sector.

It may seem odd that this sectoral analysis shows very small influence on hiring demand from the enormous enrollment growth in public two-year colleges which is forecast for the decade ahead. The reason is that, historically, the two-year colleges have hired only a very small proportion of doctorates into available teaching positions, and if the future is like the past, their very large requirement for total new faculty in the 1970's will translate into a very small demand for doctorates.

We then examine, in Section IV, the effect in each sector of modifying both the student-faculty ratio and the percentage of new positions filled with doctorates, according to various hypotheses.

Smoothing Demand for New Faculty

The Cartter projection, because its driving variable is enrollment, and because the other assumptions are held constant throughout the interval, shows positive hiring demand for doctorates throughout the 1970's and then, in the early 1980's, negative hiring demand for several years when total enrollment is expected to decline. A slow recovery of hiring demand is then shown for the last few years of the 1980's.

The "Haggstrom" enrollment series is a higher one and thus results in a slightly less bleak picture for the 1980's, when the projection of new doctorates hired is made using all of the other "No Change" assumptions with the exception of the enrollment series. Nevertheless, doctoral hiring demand almost disappears from 1984 to 1986 in this projection.

We discuss this problem of peak and trough in Section V, utilizing two approaches to the amelioration of what otherwise will be a grim period of adjustment. The first approach is that of averaging the total hiring demand. The second is to postulate possibilities of growth in hiring demand by various means.

Conclusions

In Section VI we offer concluding comments and policy observations, directed to the various types of decision-makers who will be taking an interest in this problem.

II. RECENT HISTORICAL TRENDS IN STUDENT-FACULTY RATIOS

We present here evidence from two sources on trends in student-faculty ratios during the period 1950-67. Roughly speaking, during this period student-faculty ratios increased in public universities and in institutions other than universities, and declined somewhat in private universities.

Evidence from Office of Education Statistics

We first consider estimates of student-faculty ratios calculated from statistics on numbers of faculty and students published by the Office of Education. For these estimates, institutions have been grouped in six categories, based on a two-way classification:

a. Public, private.

b. Universities, "other four-year colleges," two-year colleges.

For each of the years 1953, 1955, 1957, 1959, 1963, 1966, and 1967, and for each of the six categories, we have estimated the ratio of total full-time-equivalent students to total full-time-equivalent faculty. The results are presented in Table 2-1. It should be emphasized that these estimates may be subject to considerable error because of the non-comparability of statistics in different years and the difficulties of estimating full-time equivalents. The comparability problem is particularly severe before 1957. Table 2-1 indicates that student-faculty ratios increased in all categories except that of private universities: in this last category the ratio decreased from 1953 to 1963 and then increased a little between 1963 and 1967.

TABLE 2-1: STUDENT-FACULTY RATIOS, 1953-1967, FROM OFFICE OF EDUCATION STATISTICS

	UNIVERSITIES		FOUR YEAR COLLEGES		TWO YEAR COLLEGES	
	Public	Private	Public	Private	Public	Private
1953	13.58	12.26	13.65	12.09	17.64	11.72
1955(1)	14.54	12.34	15.07	13.25	20.55	13.41
1955(2)	14.54	12.34	15.08	13.27	20.40	12.77
1957	13.01	11.76	15.30	12.93	19.00	12.21
1959	13.91	11.70	15.90	13.30	18.50	13.80
1963	15.40	10.50	17.00	13.50	19.40	15.01
1966	16.79	11.20	17.59	14.50	22.59	17.98
1967	16.64	11.26	17.86	14.54	21.64	17.72
% Change, 1957-67	28	- 4	17	12	14	45

Source: U.S. Office of Education statistics. See Appendices for method of calculation and data sources.

Evidence from the "ACE Sample"

We consider next a sample of 372 colleges and universities taken from a larger set of more than 900 institutions for which data were available[4] on numbers of faculty and students for the years 1950, 1954, 1958, and 1962. These 372 institutions included all those in the larger set that either (a) were purely undergraduate institutions, or (b) had substantial graduate enrollment in each of the four years mentioned above, but were neither purely graduate schools nor primarily religious or professional schools. In this sub-section these two groups will be called "undergraduate schools" and "universities," respectively; there are 259 "undergraduate schools" and 113 "universities." With a few exceptions, we had data on numbers of faculty and students for each of the 372 schools for each of the four years. Thus we were able to avoid the problems of possible changes in numbers and classification of institutions. On the other hand, our sample is not random, and it may well not be "representative."

After further subdividing the undergraduate schools and universities into public, private non-sectarian (hereafter called "private"), and private sectarian (hereafter called "sectarian"), we calculated the average student-faculty ratio for each of the resulting six groups for each of the four years in our observation period (1950-62). The results are presented in Table 2-2.

The mean student-faculty ratio clearly rose in each of the undergraduate groups, with the greatest percentage increase in the public schools

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[4] American Universities and Colleges, American Council on Education, Washington, D. C., 1952, 1956, 1960, 1964. Numbers for faculty and students are "head counts," not full-time equivalents.

TABLE 2-2

ACE Sample
Average Student-Faculty Ratios

	Undergraduate			Universities		
	Public	Private Non-Sectarian	Private Sectarian	Public	Private Non-Sectarian	Private Sectarian
1950	10.6	9.8	9.7	12.0	9.0	12.8
1954	11.6	10.4	10.3	12.7	8.0	11.5
1958	13.5	10.7	11.6	12.9	7.9	11.8
1962	14.8	11.4	12.4	13.1	7.9	10.5
	Average Student-Faculty Ratios					
	45	51	162	55	45	14
	Number of Institutions in Each Group					

Note: The figures shown in the table are actually the reciprocals of the averages of the faculty-student ratio for each group.

Source: Radner, R. and L.S. Miller, "Demand and Supply in U.S. Higher Education: A Progress Report," American Economic Review, 60, May 1970, pp. 326-334.

and the smallest in the private schools. The mean student-faculty ratio rose slightly in the public universities, but fell in the other universities. In both undergraduate schools and universities the private schools ended the period with the lowest ratios, and the public schools with the highest. Of course, one suspects that the decreases in the universities are due to the increased fraction of the total enrollment represented by graduate students.

Variability of Student-Faculty Ratios Among Institutions

More detailed examination of the "ACE Sample" and of Office of Education data on individual institutions reveals considerable variability of the student-faculty ratio among institutions, even within the same category.[5] The "ACE Sample" suggests that the variability of the student-faculty ratios among institutions declined in the undergraduate groups but remained relatively stable in the university groups. A cross-section analysis of Office of Education data for 1966 indicates that considerable variation among institutions remains even after adjusting for differences in size, faculty salary, "quality," and other institutional variables.

Thus, both over time and among institutions, the student-faculty ratio is not an immutable constant, but can vary considerably in response to changing conditions and variations in institutional policy.

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[5] See R. Radner and L.S. Miller, op.cit., and R. Radner, "Faculty-Student Ratios in U.S. Higher Education," paper presented at the Universities-National Bureau Conference on Education as an Industry, Chicago, June 4-5, 1971.

III. ALTERNATIVE PROJECTIONS OF AGGREGATE DEMAND FOR NEW FACULTY AT THE DOCTORAL LEVEL

Introduction

In this section we present six alternative projections of the number of new faculty needed at the doctoral level, for the period 1970-1990. These projections were made for each sector of higher education, as explained below, but in this section we present only the aggregate projections for all of higher education; the examination of differences among the sectors is deferred to the next section.

We first explain the simple calculations on which the projections are based, and then describe the various hypotheses that are combined to generate the six alternative projections. This is followed by the projections themselves, together with some brief remarks concerning the differences among them.

Calculation of Projections

For each sector, the calculation of the projections of the number of new faculty needed at the doctoral level involves the following variables, which are defined for each year t in the projection:

$S(t)$ = number of full-time-equivalent students

$F(t)$ = number of full-time-equivalent faculty

$R(t)$ = student-faculty ratio

$N(t)$ = total new faculty needed in the sector

$P(t)$ = proportion (fraction) of new faculty needed at the doctoral level

$D(t)$ = total new faculty needed at the doctoral level.

For each sector, we hypothesize projections of $S(t)$, $R(t)$, and $P(t)$, and calculate the projections of $F(t)$, $N(t)$, and $D(t)$ that are implied by the following relationships (following Cartter, we assume that the rate of death, retirement, and net out-migration of faculty is 2% per year):

$$F(t) = \frac{S(t)}{R(t)} ,$$

$$N(t) = F(t) - F(t-1) + (.02)F(t-1) = F(t) - (.98)F(t-1) , \tag{3.1}$$

$$D(t) = P(t)N(t) .$$

These equations can be combined to give a single equation relating the projected values of total new faculty needed at the doctoral level to the projected values of students, student-faculty ratio, and proportion of new faculty at the doctoral level:

$$D(t) = P(t) \left[\frac{S(t)}{R(t)} - (.98) \frac{S(t-1)}{R(t-1)} \right] , \quad t = 1970,\ldots,1990 . \tag{3.2}$$

Alternative Hypotheses

Two alternative projections of student enrollment are used here: (1) the projection used by Cartter in his paper, and (2) one of a family of projections developed by Professor G. Haggstrom for the Carnegie Commission on the Future of Higher Education.[6] We shall call these the "Cartter" and "Haggstrom" projections, respectively; they are given in Table 3-1. The Haggstrom projection is somewhat higher than the Cartter projection, especially at the end of the 1990's. However, the difference

[6] Unpublished manuscript.

TABLE 3-1

Alternative Projections of Total Enrollment
in U.S. Higher Education, 1970-1990
(in thousands)

Year	"Cartter"	"Haggstrom"
1970	6,303	6,697
1971	6,755	7,125
1972	7,115	7,623
1973	7,489	8,095
1974	7,831	8,526
1975	8,197	8,925
1976	8,525	9,280
1977	8,799	9,601
1978	9,050	9,918
1979	9,324	10,205
1980	9,537	10,428
1981	9,705	10,596
1982	9,834	10,661
1983	9,746	10,601
1984	9,514	10,477
1985	9,228	10,312
1986	8,862	10,175
1987	8,639	10,114
1988	8,541	10,116
1989	8,545	10,214
1990	8,674	10,378

TABLE 3-2

Summary of Hypotheses for Alternative Projections

	Student-Faculty Ratio (R)	Proportion Hired at Doctoral Level (P)
No Change (from 1967)	(1)	(1)
Intermediate	(2)	(2)
Adequate Finance	(2)	(3)

Alternative Hypotheses for Student-Faculty Ratio

	Public Universities	Private Universities	Public 4-Year Colleges	Private 4-Year Colleges	Public 2-Year Colleges	Private 2-Year Colleges
(1) 1967 Values	16.64	11.26	17.86	14.54	21.64	17.72
(2) "Target" Values	14.0	10.0	15.0	13.0	19.0	13.0

Alternative Hypotheses for Proportion Hired at Doctoral Level

	Universities	4-Year Colleges	2-Year Colleges
(1) 1967 Average Values	.543	.389	.059
(2) 1967 Associate Professor Values	.674	.538	.149
(3) "Target" Values	.90	.75	.30

never exceeds 20 percent of the Cartter projection, and for most of the period the difference is less than 10 percent.

Two alternative hypotheses are considered for the student-faculty ratio. The first hypothesis assumes that the student-faculty ratio in each sector will remain at its 1967 value. The second hypothesis assumes that the student-faculty ratio in each sector will decline in the 1970's and 1980's to a value near the bottom end of the range of values experienced by that sector during the period 1953-67 (using the ratios reported in Table 2-1). These lower ratios are called here the "target" values for the student-faculty ratio, and are given in Table 3-2. It is assumed under the second hypothesis that during the period 1970-1990 the student-faculty ratio in each sector will decrease linearly to the target value in 1990. Given the experience of the past two decades, such target values for 1990 would not be unreasonable in a situation with an excess supply of Ph.D.'s, if institutions of higher education were adequately financed.

Three alternative hypotheses are considered regarding $P(t)$, the proportion of new faculty hired at the doctoral level. The first assumes that in each sector $P(t)$ will remain constant at the 1967 value. The second hypothesis assumes that in each sector $P(t)$ will increase linearly to the average value for all associate professors in that sector in 1967. The third hypothesis assumes that $P(t)$ will increase linearly to certain "target" values, which are higher than the average 1967 associate professor values, but still would be reasonable target values to achieve in a 20-year period if a sustained effort were made to increase the percentage of new faculty at the doctoral level.

The rationale for the second hypothesis concerning $P(t)$ is that the average proportion with the Ph.D. for associate professors gives a better

estimate of the proportion of young faculty with doctoral level training than does the overall proportion for all faculty in a given sector. Furthermore, the comparable figure for assistant professors is probably not appropriate, because in many fields assistant professors are hired while they are still completing the last stages of their doctoral training and research.

The various hypotheses were put together in a number of different combinations, of which we have chosen six to present in this paper. Three combinations of hypotheses regarding the student-faculty ratios and the proportion hired at the doctoral level are summarized in Table 3-2; these are labelled "No Change," "Intermediate," and "Adequate Finance." Each of these three combinations was then combined with each of the two alternative enrollment projections, "Cartter" and "Haggstrom," given in Table 3-1. The resulting six projections of total new faculty needed at the doctoral level are presented in Table 3-3 and in Figures 3-1 to 3-3.

Comparison of Projections

We first consider the effect of using the "Haggstrom" rather than the "Cartter" projection of enrollment. Although the "Haggstrom" projection is not more than 10 percent higher for most of the period, and never more than 20 percent higher, the <u>total</u> new faculty at the doctoral level from 1970 to 1990 is approximately 33 percent higher under the "Haggstrom" projections than under the "Cartter" projections, for each of the three cases. The time pattern of new faculty at the doctoral level is similar in both sets of projections, with peaks in the 1970's and troughs in the 1980's, but the differences between corresponding projections are generally most

TABLE 3-3a

Alternative Projections of New Faculty Needed
at the Doctoral Level (TNFDL)
Using the "Cartter" Projection of Student Enrollment
(in thousands)

Year	No Change	Intermediate	Adequate Finance
1970	7.16	8.40	8.82
1971	11.90	13.68	14.69
1972	9.92	11.91	13.07
1973	10.23	12.58	14.10
1974	9.56	12.17	13.91
1975	10.12	13.15	15.32
1976	9.29	12.53	14.88
1977	8.18	11.54	13.96
1978	7.66	11.21	13.80
1979	8.15	12.13	15.17
1980	6.95	10.92	13.90
1981	6.66	10.74	13.81
1982	5.88	9.97	13.01
1983	1.42	4.07	5.48
1984	-1.58	- .07	.06
1985	-2.73	-1.76	-2.21
1986	-4.48	-4.42	-5.84
1987	-1.67	- .37	- .34
1988	.79	3.34	4.81
1989	2.80	6.54	9.36
1990	5.29	10.67	15.33
TOTAL	111.52	168.93	205.08

TABLE 3-3b

Alternative Projections of New Faculty Needed
at the Doctoral Level (TNFDL)
Using the "Haggstrom" Projection of Student Enrollment
(in thousands)

Year	No Change	Intermediate	Adequate Finance
1970	11.67	13.13	13.78
1971	11.48	13.30	14.27
1972	13.09	15.42	16.91
1973	12.53	15.23	17.05
1974	11.67	14.68	16.77
1975	11.03	14.33	16.70
1976	10.07	13.59	16.13
1977	9.39	13.15	15.90
1978	9.28	13.37	16.44
1979	8.65	12.94	16.19
1980	7.40	11.67	14.87
1981	6.95	11.31	14.55
1982	4.85	8.76	11.46
1983	2.27	5.42	7.26
1984	.92	3.63	4.99
1985	.06	2.47	3.48
1986	.53	3.20	4.52
1987	2.04	5.50	7.75
1988	3.28	7.52	10.64
1989	5.19	10.68	15.21
1990	6.52	13.06	18.77
TOTAL	148.87	222.35	273.65

Figure 3-1

PROJECTED DEMAND FOR NEW DOCTORAL LEVEL FACULTY (TNFDL) - (in thousands)

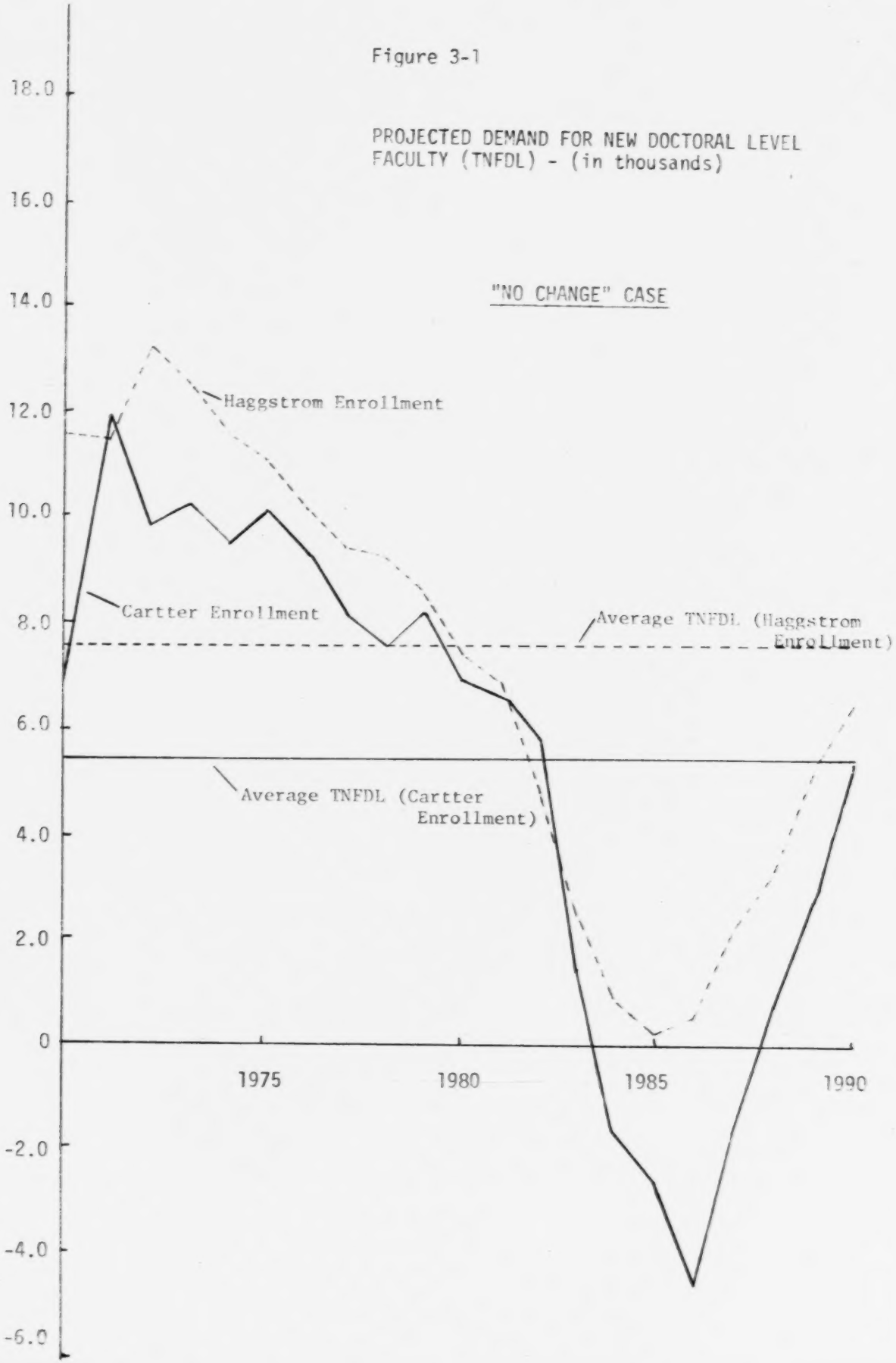


Figure 3-2

PROJECTED DEMAND FOR NEW DOCTORAL LEVEL FACULTY (TNFDL) - (in thousands)

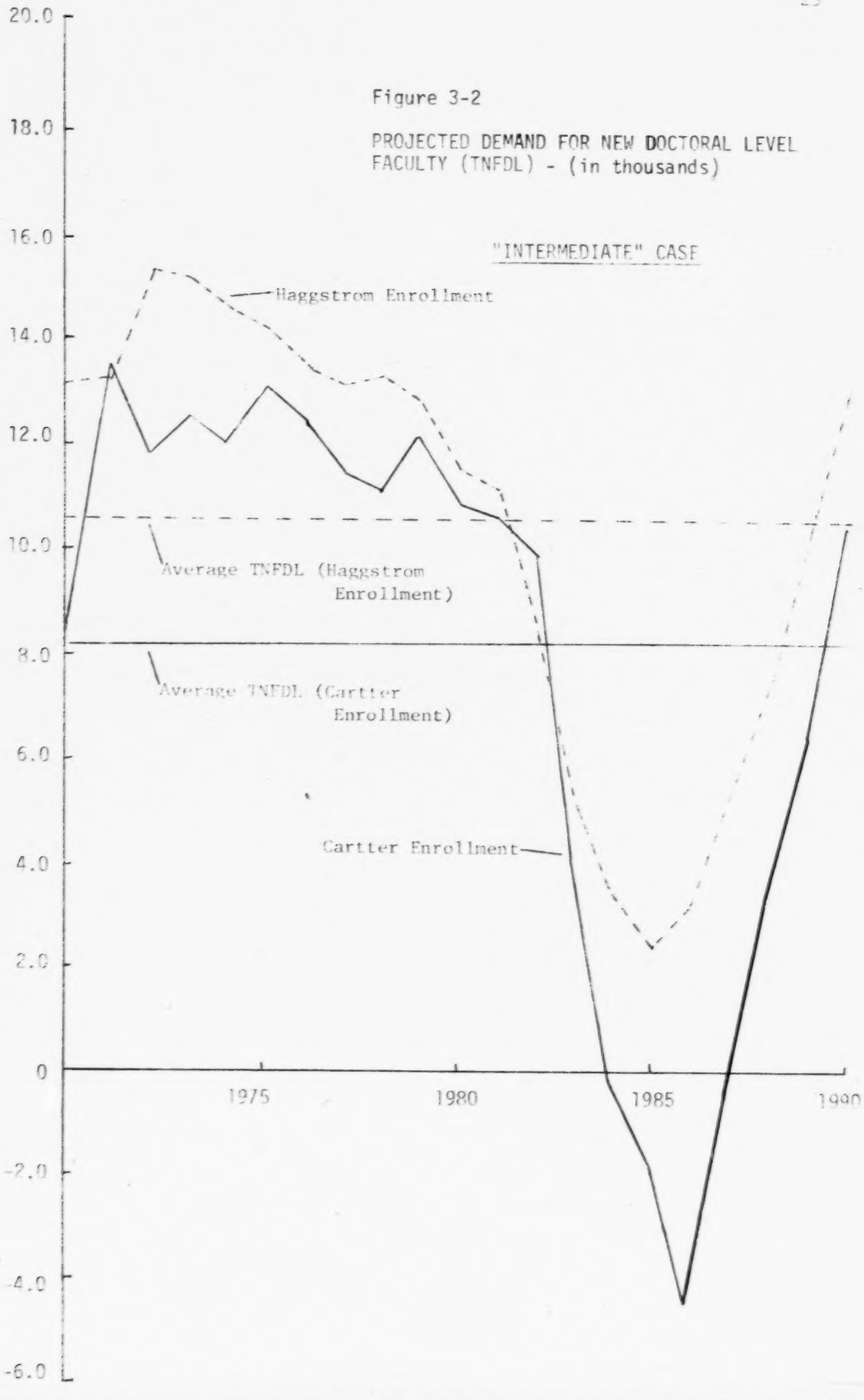
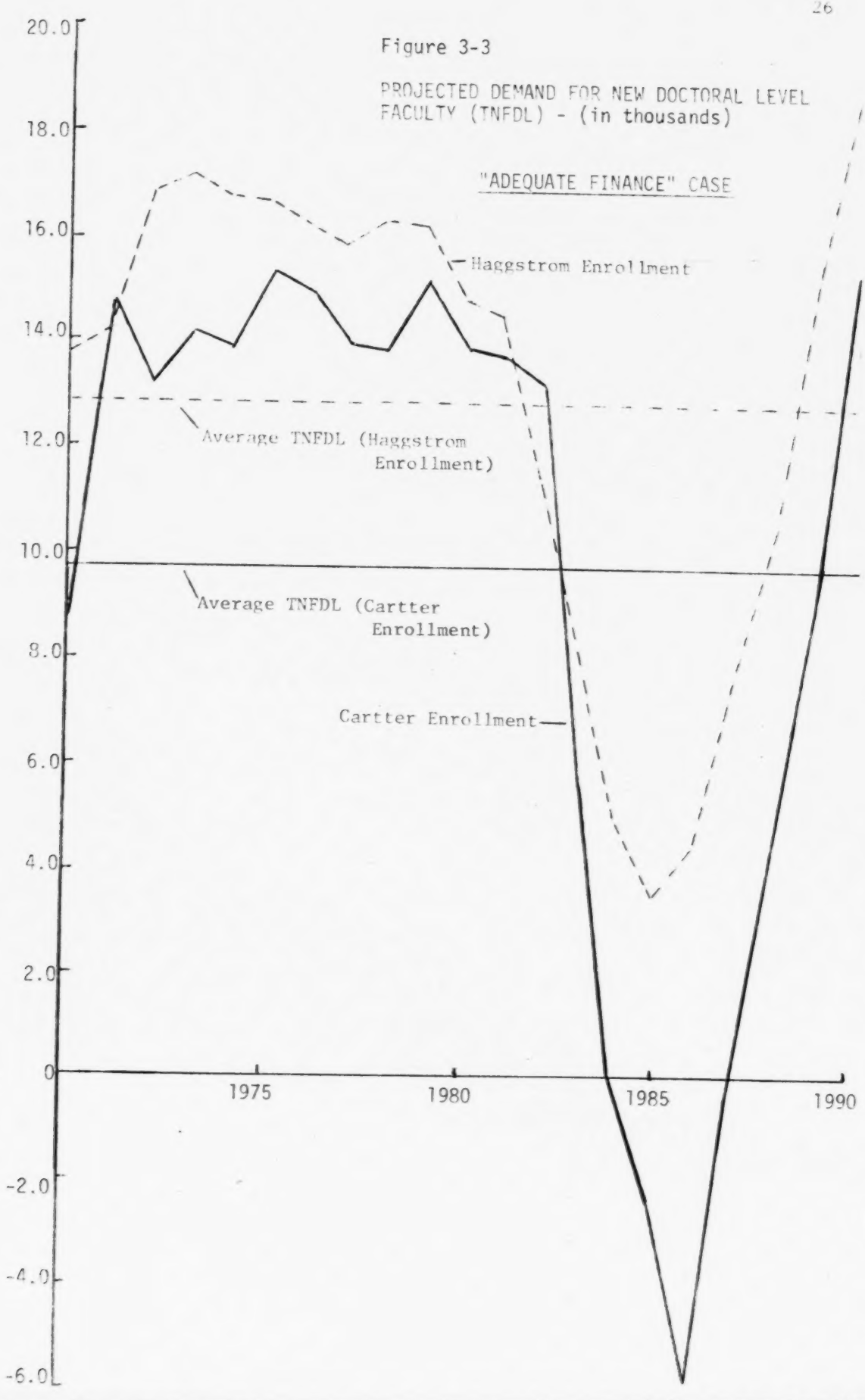


Figure 3-3

PROJECTED DEMAND FOR NEW DOCTORAL LEVEL FACULTY (TNFDL) - (in thousands)



pronounced near the peaks and near the troughs.

For any one enrollment projection, the three cases ("No Change," "Intermediate," and "Adequate Finance") differ markedly in their projections of total new faculty at the doctoral level over the period 1970-1990. Thus this total is almost twice as large for the "Adequate Finance" case as for the "No Change" case (for each enrollment projection).

However, all projections agree in predicting a sharp dip in new faculty at the doctoral level in 1985 or 1986, the lowest dip (to -5,840) occurring in the Cartter enrollment "Adequate Finance" case, and the shallowest dip (to 3,480) in the Haggstrom enrollment "Adequate Finance" case. It is not surprising that the Haggstrom enrollment "Adequate Finance" case minimizes the dip in the 1980's, but one might be surprised by the fact that the lowest dip occurs in the Cartter enrollment "Adequate Finance" case, rather than in the Cartter enrollment "No Change" case, which seems to be the least favorable. However, the lower the student-faculty ratio, the greater in magnitude will be the fluctuations in required numbers of faculty caused by any given pattern of fluctuation in enrollments; hence the greater sensitivity of required numbers of new faculty to the dip in enrollment in the "Adequate Finance" case.

In the foregoing analysis we have concentrated on the examination of policies that would produce a demand for doctorates higher than that predicted by Cartter. However, two plausible trends in the environment of higher education could imply projections of demand for doctorates that are lower than the Cartter enrollment "No Change" model suggests.

(1) a greater shift of the enrollment distribution away from the universities (public and private) and toward the two-year colleges than we have assumed; and

(2) a more stringent fiscal environment, leading to student-faculty

ratios higher, for some or all sectors, than the 1967 student-faculty ratios.

In Section IV below, we have shown our assumptions about the future distribution of enrollment among the sectors of U.S. higher education. While our assumption is that some shift away from the universities and toward the two-year colleges is expected to occur, a still more drastic shift (actuated by financing pressures on students or on institutions, particularly private institutions) is quite possible.

Fiscal pressures increasing student-faculty ratios would also give rise to lower academic hiring demand for doctorates than has been projected. If we assume that the weighted average student-faculty ratio of 17.3:1 in 1967 would be increased to 22.3:1 by 1981, then we can project a 40% decrease in hiring demand through 1981, as compared with that derived using the other assumptions of the Cartter enrollment "No Change" model. The results are shown in Table 3-4.

TABLE 3-4

Demand for New Faculty at the Doctoral Level (TNFDL), 1970-1981, When: (1) Sectoral Student-Faculty Ratios Remain Constant at 1967 Level, and (2) Sectoral Student-Faculty Ratios Increase to 1981

	Cartter Enrollment "No Change" Projection			
	(1)		(2)	
	1967 Student-Faculty Ratio	TNFDL 1970-81 (in thousands)	Increased 1981 Student-Faculty Ratio	TNFDL 1970-81 (in thousands)
Public Universities	16.64	38.42	21.16	21.76
Private Universities	11.26	10.14	13.55	5.03
Public 4-Year Colleges	17.86	34.16	21.76	22.97
Private 4-Year Colleges	14.54	17.81	17.22	11.53
Public 2-Year Colleges	21.64	5.01	26.83	3.38
Private 2-Year Colleges	17.72	0.30	20.49	0.22
Total		105.84		64.89

1967 Average Student-Faculty Ratio: 17.3:1

1981 Average Student-Faculty Ratio: 22.3:1

Note: The student-faculty ratio averages are weighted according to the estimated enrollment distribution in the given year.

IV. HIRING DEMAND FOR NEW DOCTORATES IN EACH OF THE SECTORS OF AMERICAN HIGHER EDUCATION

We have divided American higher education into six sections for this study: the private universities; the public universities; the private two-year colleges; the public two-year colleges; all other private institutions (chiefly B.A. granting, but including some which offer Master's degrees as well); and all other public institutions (again, chiefly B.A. granting, but including some offering post-baccalaureate degrees), called private four-year colleges and public four-year colleges in our analysis. The aggregate projected enrollment for all of higher education was distributed among the six sectors according to (assumed) percentages as shown in Table 4-1.

However, our assumptions concerning sectoral enrollment trends need some comment. The best information available to us was judgmental, although the Carnegie Commission staff expects forthcoming studies to produce refined estimates of sectoral enrollments. Table 4-1 is constructed on the hypothesis that the public universities and private universities will experience relatively slow growth in enrollment, and that the latter, in particular, will have a considerable shrinkage in their market share during the next twenty years. With heavy emphasis on undergraduate enrollment growth, especially in the 1970's, the public four-year colleges are expected to increase their percentage of total enrollment. Private four-year colleges, compelled to increase student charges, face a slowly declining market share between 1970 and 1990. Public four-year colleges, continuing the trend of the 1960's with the strong political support from all levels of government that has financed their spectacular growth so far, are expected to continue

TABLE 4-1

Assumed Fractional Distribution of Each Year's Total Enrollment
Among the Six Sectors of U.S. Higher Education

Year	Public Universities	Private Universities	Public 4-Year Colleges	Private 4-Year Colleges	Public 2-Year Colleges	Private 2-Year Colleges
1970	.242	.082	.255	.163	.239	.020
1971	.240	.080	.256	.161	.243	.020
1972	.239	.078	.258	.159	.247	.019
1973	.238	.075	.259	.157	.252	.019
1974	.237	.073	.260	.155	.256	.019
1975	.235	.071	.261	.153	.260	.019
1976	.234	.069	.263	.151	.265	.019
1977	.233	.067	.264	.149	.269	.019
1978	.232	.065	.265	.146	.273	.018
1979	.230	.063	.267	.144	.278	.018
1980	.229	.061	.268	.142	.282	.018
1981	.227	.060	.269	.142	.284	.018
1982	.225	.059	.270	.142	.286	.018
1983	.223	.058	.271	.142	.288	.018
1984	.221	.057	.272	.142	.290	.019
1985	.219	.056	.274	.142	.291	.019
1986	.216	.056	.275	.141	.293	.019
1987	.214	.055	.276	.141	.295	.019
1988	.212	.054	.277	.141	.297	.019
1989	.210	.053	.278	.141	.299	.019
1990	.208	.052	.279	.141	.301	.019

Source: Tentative estimates for selected years, by Carnegie Commission staff, interpolated and extrapolated by the authors.

that growth in the twenty-year interval ahead, ending with 30% of total enrollment by 1990. Private two-year colleges are very small in both absolute and percentage enrollment now and are not expected to change in significance.

While these assumed enrollment trends seem quite plausible in the light of recent experience, numerous factors might change the trends. A substantial new program of federally-financed student aid or cost-of-education allowances might improve the ability of private universities and four-year colleges to obtain enrollment growth, with consequent shifts away from their public counterparts.

The continuing relative and absolute growth assumed for public two-year colleges could be reduced by several factors. Large financial aid programs might impel some students to enter degree-granting institutions as freshmen if their main motive for attending two-year colleges now is to save money on college attendance. Public concern may arise in the future over the very high rates of attrition from academic programs in the community colleges, causing some of them to be made into degree-granting institutions and others to experience some reduction in student preference and in financing from state sources.

In the first set of disaggregated projections, the Cartter enrollment "No Change" case, the sectoral student-faculty ratios and the proportions of new faculty hired were assumed to continue the historical figures derived from 1967 U.S. Office of Education data, as shown below:

	1967 Student-Faculty Ratio	1967 Proportion of Total Faculty with Doctorate
Public Universities	16.64	.543
Private Universities	11.26	.543
Public 4-Year Colleges	17.86	.389
Private 4-Year Colleges	14.54	.389
Public 2-Year Colleges	21.64	.059
Private 2-Year Colleges	17.72	.059

Source: Table 3-2.

Using these assumptions we projected the annual number of new faculty and new faculty with the doctorate for each sector from 1970-1990. The results for the Cartter enrollment "No Change" case are shown in Table 4-2. It is of interest that the figure for total new faculty hired before applying the proportion hired at the doctoral level is quite high in the public two-year colleges. This number approximates seven thousand annually from 1971-80 before the projected enrollment declines of the 1980's begin to take hold; but in this projection, the very low percentage of faculty hired with the doctorate (5.9%) reduces to insignificant proportions the contribution the public two-year colleges make to total hiring demand for new doctorates.

Table 4-3 shows the fractional distributions of total faculty at the doctoral level and total new faculty at the doctoral level for 1970-81. This table contrasts the distribution of future demand for new doctoral faculty with the current allocation of doctoral faculty. Private universities, in 1970, have 17.5% of the total doctoral faculty in all sectors but hire only 11.4% of total new doctoral faculty in all sectors while public four-year colleges have only 26.0% of total doctoral faculty but place a demand for 31.3% of total new doctoral faculty.

Several policy issues and possible questions of hiring response to the supply situation suggest themselves from the difference between total new faculty hired and the computed demand for doctoral-level new faculty. First, two-year colleges may well find that their traditional aversion to hiring Ph.D.'s is replaced by greater advantage in doing so as the number of willing universities will need to adjust their curricula, increase their emphasis on preparation for teaching, and change their ways of placing students in jobs.

Similarly, future supply conditions may alter the historical differences between total new faculty (TNF) and total new faculty with the

TABLE 4-2

ESTIMATED TOTAL NEW FACULTY (TNF) AND NEW FACULTY WITH THE DOCTORATE (TNFDL) HIRED BY EACH SECTOR, 1970-1990, IN THE CARTTER ENROLLMENT "NO CHANGE" PROJECTION
(in thousands)
[Disaggregated constant 1967 student-faculty ratios and proportion at the doctoral level]

	Public Universities		Private Universities		Public 4-Yr. Colleges		Private 4-Yr. Colleges		Public 2-Yr. Colleges		Private 2-Yr. Colleges		Total All Sectors	
	TNF	TNFDL	TNF	TNFDL	TNF	TNFDL	TNF	TNFDL	TNF	TNFDL	TNF	TNFDL	∑ TNF	∑ TNFDL
1970	4.80	2.61	1.50	0.82	5.58	2.17	3.19	1.24	5.18	0.31	0.37	0.02	20.62	7.17
1971	7.87	4.27	2.99	1.62	8.71	3.39	5.47	2.13	7.72	0.46	0.57	0.03	33.33	11.90
1972	6.64	3.61	2.17	1.18	7.62	2.96	4.46	1.74	6.97	0.41	0.46	0.03	28.32	9.93
1973	6.84	3.71	2.16	1.17	7.99	3.11	4.57	1.78	7.39	0.44	0.48	0.03	29.43	10.24
1974	6.42	3.49	1.83	1.00	7.70	2.99	4.18	1.63	7.31	0.43	0.49	0.03	27.93	9.57
1975	6.84	3.71	1.87	1.02	8.21	3.19	4.38	1.71	7.81	0.46	0.47	0.03	29.58	10.12
1976	6.29	3.42	1.60	0.87	7.77	3.02	3.88	1.51	7.61	0.45	0.43	0.03	27.58	9.30
1977	5.62	3.05	1.09	0.59	7.18	2.79	3.33	1.30	7.22	0.43	0.42	0.03	24.86	8.19
1978	5.27	2.86	0.86	0.47	6.97	2.71	3.05	1.19	7.11	0.42	0.34	0.02	23.60	7.67
1979	5.60	3.04	0.89	0.48	7.43	2.89	3.23	1.26	7.60	0.45	0.36	0.02	25.11	8.14
1980	4.84	2.63	0.54	0.29	6.66	2.59	2.59	1.01	7.06	0.42	0.35	0.02	22.04	6.96
1981	3.71	2.02	1.16	0.63	6.03	2.35	3.37	1.31	5.53	0.33	0.42	0.03	20.22	6.67
1982	3.17	1.72	0.94	0.51	5.47	2.13	3.09	1.20	5.10	0.30	0.39	0.02	18.16	5.88
1983	0.24	0.13	-0.21	-0.11	2.24	0.87	0.99	0.39	2.25	0.13	0.22	0.01	5.73	1.42
1984	-1.70	-0.92	-0.95	-0.52	0.08	0.03	-0.49	-0.19	0.34	0.02	0.02	0.00	-2.70	-1.58
1985	-2.43	-1.32	-1.22	-0.67	-0.84	-0.33	-1.00	-0.39	-0.47	-0.03	-0.05	-0.00	-6.01	-2.74
1986	-3.56	-1.93	-1.54	-0.84	-2.23	-0.87	-1.89	-0.74	-1.67	-0.10	-0.14	0.01	-11.03	-4.47
1987	-1.69	-0.92	-0.92	-0.50	-0.17	-0.07	-0.50	-0.20	0.14	0.01	0.00	0.00	-3.14	-1.68
1988	-0.11	-0.06	-0.32	-0.17	1.73	0.67	0.61	0.24	1.73	0.10	0.18	0.01	3.82	0.79
1989	1.15	0.63	0.15	0.08	3.29	1.28	1.58	0.61	3.15	0.19	0.24	0.01	9.56	2.80
1990	2.69	1.46	0.72	0.39	5.21	2.03	2.84	1.11	4.90	0.29	0.37	0.02	16.73	5.30

TABLE 4-3

ESTIMATED PROPORTION OF (1) TOTAL FACULTY AT DOCTORAL LEVEL (TFDL), AND
(2) TOTAL NEW FACULTY AT DOCTORAL LEVEL (TNFDL) IN EACH SECTOR OF HIGHER EDUCATION, 1970-1981

CARTTER ENROLLMENT "NO CHANGE" PROJECTION

[Disaggregated constant 1967 student-faculty ratios and proportion at doctoral level]

	Public Universities		Private Universities		Public 4-Yr. Colleges		Private 4-Yr. Colleges		Public 2-Yr. Colleges		Private 2-Yr. Colleges	
	TFDL	TNFDL	TFDL	TNFDL	TFDL	TNFDL	TFDL	TNFDL	TFDL	TNFDL	TFDL	TNFDL
1970	.351	.364	.175	.114	.247	.303	.195	.173	.029	.043	.003	.003
1971	.352	.359	.172	.136	.250	.255	.193	.179	.030	.038	.003	.003
1972	.352	.363	.169	.119	.253	.299	.192	.175	.030	.041	.003	.003
1973	.353	.363	.165	.114	.256	.304	.191	.174	.031	.043	.003	.003
1974	.354	.365	.162	.104	.260	.313	.190	.170	.032	.045	.003	.003
1975	.355	.367	.158	.100	.263	.316	.189	.169	.033	.046	.003	.003
1976	.355	.368	.155	.093	.266	.325	.187	.162	.034	.048	.003	.003
1977	.356	.373	.152	.072	.269	.341	.186	.159	.034	.052	.003	.003
1978	.357	.373	.148	.061	.273	.353	.185	.155	.035	.055	.003	.003
1979	.357	.374	.144	.059	.276	.355	.184	.154	.036	.055	.003	.003
1980	.358	.378	.141	.042	.279	.372	.182	.145	.037	.060	.003	.003
1981	.356	.303	.139	.095	.282	.352	.183	.197	.037	.049	.003	.004

doctorate (TNFDL) shown in Table 4-2. First, every one of the four sectors that contributes significantly to doctoral hiring demand--public and private universities, and public and private four-year colleges--could accommodate a significant number of doctorates in teaching positions. The total of all positions we project from the Cartter enrollment "No Change" assumptions not to be filled by candidates at the doctoral level in these four sectors from 1970-80 is 11,460 or 55% of all new faculty positions.

As these types of institution, which already display historical hiring preference for doctorates, experience greater and greater ease of filling positions with willing applicants who possess the doctorate, the assumption of fixed doctoral hiring percentages may well prove to be wrong.

The same type of hiring response may occur in the public two-year colleges. Their total new faculty requirements for 1970-80 are projected to be 78,890, whereas the projected number of doctorates hired is only 4,680, because of this sector's very low historical percentage of doctorates.

A plentiful supply of doctorates seeking teaching positions could alter this pattern in two-year colleges, but there is reason to be cautious about the prospects for this. Recent evidence from a study by Lucian Pugliaresi of the pattern of hiring preferences in California community colleges suggests a probable resistance to the hiring of Ph.D.'s on a wide scale.[7] Pugliaresi found that nearly all of the community college administrators he interviewed would not hire Ph.D.'s because, they said, the typical doctorate tended to be dissatisfied with heavy and diversified teaching obligations, resented the lack of opportunity to do research and scholarly work, and did not have a positive interest in the academic mission of the community college. The modal hiring preference of all California community

[7] Pugliaresi, L., "Inquiries into a New Degree: The Candidate in Philosophy," Paper P-13, Ford Foundation Program for Research in University Administration, University of California, Berkeley, 1970.

colleges in a recent year, cited by Pugliaresi, was for candidates who had the Master's degree and several years of prior teaching experience.

Two other qualitative observations come forward from Pugliaresi's interviews. The community college administrators did not regard experience as a Teaching Assistant as "real" teaching experience; and, while they were antagonistic to the Ph.D., they expressed strong interest in possible hiring of people with a Doctor of Arts degree or, in other words, an advanced degree designed as a preparation for a purely teaching career.

Alternative Sectoral Enrollment Distributions

Our sectoral projections of both total new faculty and new doctoral level faculty are significantly affected by the assumed trends in the sectoral composition of enrollment, and the reader should discount our projections accordingly if the assumptions about sectoral enrollment trends do not appear satisfactory to him. To test the sensitivity of our projections to assumed sectoral enrollment distributions (taken from the Carnegie Commission estimates), we developed an alternative enrollment distribution. Under an assumption that there might be some future disillusionment with two-year colleges, we held two-year college enrollments constant at the 1968 level and redistributed their projected enrollment increases to four-year colleges.

The effect on academic demand for doctorates is to increase the twenty-year total to 126,000 or about a 13% increase, when using all other Cartter enrollment "No Change" assumptions, as compared with the base case. Tables 4-4a and 4-4b show these results.

TABLE 4-4a

ALTERNATIVE SECTORAL ENROLLMENT PROPORTIONS--ASSUMING TWO-YEAR COLLEGES HOLD AT CONSTANT ENROLLMENT PROPORTION--FOR SELECTED YEARS FROM 1970-1990

Sector	1970	1980	1990
Public Universities	.242	.229	.208
Private Universities	.0816	.0609	.052
Public 4-Year Colleges	.263	.315	.345
Private 4-Year Colleges	.164	.145	.145
Public 2-Year Colleges	.231	.235	.235
Private 2-Year Colleges	.019	.015	.015

Note: Annual fractions were used for the disaggregated enrollment calculations, but only selected years are given here.

TABLE 4-4b

SUM OF TOTAL NEW FACULTY HIRED AT DOCTORAL LEVEL (TNFDL) FROM 1970-1990 USING (1) ALTERNATIVE ENROLLMENT DISTRIBUTION, AND (2) ENROLLMENT DISTRIBUTION FROM CARNEGIE COMMISSION ESTIMATES*

Cartter Enrollment "No Change" Projection

Sector	(1) Using Alternative Enrollment Distribution (from Table 4-4a) [in thousands] TNFDL	(2) Using Carnegie Commission Estimates of Enrollment Distribution [in thousands] TNFDL
Public Universities	37.21	37.21
Private Universities	8.31	8.31
Public 4-Year Colleges	54.98	39.91
Private 4-Year Colleges	21.01	19.82
Public 2-Year Colleges	4.01	5.90
Private 2-Year Colleges	0.22	0.38
Total (all sectors):	125.74	111.53

*See Table 4-1.

The Carnegie Commission, recommending the establishment of Doctor of Arts degree programs as a fully parallel option to the (research-oriented) Ph.D., applied essentially the same logic to the situation. So far, only a few doctorate-producing institutions have adopted this approach, but with the prodding of the Commission's recommendations, more will undoubtedly do so in the future.

This leads us to a policy suggestion directed toward the doctorate-producing institutions, especially the public universities in regions where significant expansion of public two-year colleges will be taking place. Whether they adopt the approach of a separate type of degree or not, these institutions will need to take specific actions on several fronts if they are to expect their graduate students to be actively desired for community college teaching and their own claims for budgetary support for advanced graduate programs to be well-justified in the 1970's, including the following:

1) overhaul of doctoral curricula for more breadth and more attention to teaching preparation;

2) specific arrangements for teaching internships and other means of developing teaching skills through supervised practice, possibly through cooperative schemes with neighboring community colleges;

3) emphasis on the respectability and desirability of the teaching career; and

4) establishment of firmer lines of communication with community colleges in the placement process.

V. SMOOTHING DEMANDS FOR NEW FACULTY

Cartter's own projection of the academic demand for doctorates shows a deep trough in the early 1980's, with negative demand for several years in the middle of that decade. (Because the number of faculty vacancies created by death, retirements and withdrawals from academic work is assumed to be a constant percentage each year of the total stock of faculty, a negative hiring rate can be interpreted to mean that the number of vacancies created by deaths and retirements is not sufficient to adjust the total number of faculty to the available enrollment, thus some non-tenured faculty positions are abolished in a year of negative demand, and the people who previously filled them are obliged to find other types of employment.)

As was shown in Section III above, a deep relative trough occurs during the 1980's in all of the projections of new faculty hired at the doctoral level using the Cartter enrollment projections, whatever other assumptions are made. The cause is the expected downturn of enrollment, and this in turn can be forecast from the birthrate decline of the 1960's. The "Haggstrom" enrollment projection, being higher than Cartter's, does eliminate the years of negative academic demand that Cartter shows for 1984 through 1987, but does not eliminate the troughs.

If there were some way to achieve it, smoothing of this disastrous pattern of peak and trough would be highly desirable. Failure to do so would mean the loss to academic work, and the loss of academic career opportunity, for several years' worth of Ph.D. winners in the mid-1980's. It would mean that colleges and universities, for a long time after, would have a "hole" in the age-distribution of their faculty. It could and perhaps should mean, on the supply side, either that graduate institutions

would begin to sharply curtail their entering graduate classes some five to seven years before the trough or that they would take in their customary numbers of students but expect to train them for very different kinds of employment than that of college and university teaching.

As a starting point for analysis of the smoothing problem, we can estimate the size of the adjustment problem by comparing the average annual number of doctorates hired in all sectors over a twenty-year period with the peak and the lowest annual demand in each of four projections:

Annual Number of New Faculty at Doctoral Level, 1970-90 (in thousands)

	Average	Peak	Low
Cartter Enrollment - "No Change":	5.41	11.90	-4.48
Haggstrom Enrollment - "No Change":	7.16	13.09	+ .06
Cartter Enrollment - "Adequate Finance":	9.72	15.32	-5.84
Haggstrom Enrollment - "Adequate Finance":	12.89	17.05	3.48

The peak of academic demand in the first of these four cases is near the average of the fourth. Figures 3-1 to 3-3 also illustrate this problem.

We have made calculations showing how the student-faculty ratios in the various sectors could be adjusted to "smooth" the demand for new doctoral level faculty over the 1970-1990 interval. By allowing the student-faculty ratios to rise considerably in the 1970's and then be reduced in the 1980's, the annual doctoral faculty hires could be held constant over the twenty-year period. For the Cartter enrollment - "No Change" case, adjusting the student-faculty ratios such that each sector hired only its 1970-90 annual average number of doctorates in every year would result in the following variations of the student-faculty ratios:

	1967 Ratio	Peak Ratio (Year)	Lowest Ratio (Year)
Public Universities	16.64	21.2 (1980)	15.7 (1990)
Private Universities	11.26	13.6 (1979)	10.7 (1990)
Public 4-Year Colleges	17.86	21.8 (1981)	17.1 (1989)
Private 4-Year Colleges	14.54	17.2 (1982)	13.9 (1989)
Public 2-Year Colleges	21.64	26.9 (1980)	20.8 (1989)
Private 2-Year Colleges	17.72	20.6 (1982)	17.1 (1989)

Adjustments could also be made by decreasing the percentage of new faculty hired with the doctorate, reducing this percentage in the 1970's and increasing it in the 1980's; but for obvious reasons this adjustment method is inadequate, if used by itself, to distribute doctoral hiring evenly over the twenty-year interval. The ample supply of new doctorates expected in the 1970's makes it very unlikely that a smoothing policy entailing a decrease in the percentage of doctorates hired in each sector will actually be the outcome of many thousands of decentralized decisions, and even a centralized manpower agency, if one existed, would no doubt avoid a policy so perverse in view of supply availability.

We also examined, for each type of projection, the effect on student-faculty ratios of smoothing the total number of faculty in each sector of higher education (by varying the student-faculty ratio), so that the total faculty would be held constant every year at the average for the whole period. This approach could result from budgetary controls in public agencies and institutions holding the total number of faculty positions constant. For the Cartter enrollment "No Change" case, the results were as follows (remembering that they refer to total faculty and not to the number of new faculty hired or the number hired with the doctorate):

	"No Change" Case		Effect of Smoothing by Holding Total Faculty Constant	
	Constant Student-Faculty Ratio	Peak Total Faculty (Year)	Peak Student-Faculty Ratio (Year)	Average Total Faculty (in thousands)
Public Universities	16.64	132.9 (1982)	19.2 (1982)	115.4
Private Universities	11.26	52.4 (1977)	12.3 (1977)	48.0
Public 4-Year Colleges	17.86	148.7 (1982)	20.9 (1982)	126.8
Private 4-Year Colleges	14.54	96.0 (1982)	16.3 (1982)	85.7
Public 2-Year Colleges	21.64	129.9 (1982)	26.0 (1982)	107.9
Private 2-Year Colleges	17.72	10.1 (1983)	20.0 (1983)	8.9

If the expected twenty-year average of total faculty were enforced in each sector for every year, the student-faculty ratio peaks for each sector at the level and year indicated. The annual average of total faculty required under the "smoothing" case may be compared with the total faculty required in the peak year under the Cartter enrollment "No Change" assumptions. In addition, it is of interest that "smoothing," by holding Total Faculty constant, requires about 10% fewer total faculty over the 1970-1990 period because of the different impact of the 2% per year withdrawal rate (in the Cartter enrollment "No Change" case).

If there were centralized manpower planning and management for U.S. higher education--which, fortunately from other points of view, is not the case--such a manpower agency could choose a policy--one of the four sets of assumptions, let us say--and then avoid the trough of the 1980's with respect to that policy by avoiding greater-than-average hiring of doctorates in the earlier years. However, because U.S. higher education is not

in fact highly centralized, it cannot be anticipated that the doctoral hiring trough of the 1980's will be entirely avoided by any likely range of policies adopted and enforced by individual institutions.

At the federal level, adoption of a steady, long-range policy of financing gradual enrichment of student-faculty ratios, and a policy of substantial aid to students to bolster enrollment, would both help. At the institutional level, a helpful policy would consist in some increase of student-faculty ratios in the latter 1970's in anticipation of the desirability of later hiring during what otherwise would be very dry years.

All of these comments are directed toward the smoothing of demand. As to the supply side, we shall reserve our comments about smoothing to the concluding section of this paper.

VI. CONCLUSIONS

Quantitative Implications of the Sensitivity Analysis

In Section III it was shown that academic demand for doctorates could be significantly greater than the numbers projected by Allan Cartter. Some increase will occur if total enrollments follow a more expansionary course than that used by Cartter; and the academic demand for doctorates would also be affected by both enrichments of the student-faculty ratios in the various sectors of American higher education (which will occur only if the financing base improves) and increases over historical values in the percentage of new faculty hired at the doctoral level. This last effect is likely to be induced, at least in part, by the plentiful supply of doctorates seeking college and university teaching posi'

Reduction of student-faculty ratios is often associated with conventionally-defined improvements in the "quality" of higher education. Whether such improvements will be perceived as desirable enough in public policy terms to justify significant increases of public support remains to be seen. (We would be remiss, in this part of the argument, if we did not also comment that much public policy discussion at the present time concerns the issue of increasing the productivity of college and university faculty--which is often taken to mean that student-faculty ratios should be increased beyond present levels.)

Our projections of sectoral demand for doctorates (discussed in Section IV) are based on judgmental assumptions about the distribution of future enrollment. These projections show a declining share of academic demand for doctorates by universities and a big percentage increase by public

four-year colleges. Public two-year colleges are expected to expand their total faculty numbers very substantially, but if they hire no more than the historical percentage of doctorates their demand influence will remain very small.

The magnitude of the trough of academic demand for doctorates in the 1980's is explored in Section V, with the aim of showing how demand could be smoothed over the whole twenty-year interval to 1990. It is pointed out, however, that under the conditions of policy decentralization prevalent in U.S. higher education, demand smoothing would be very difficult to achieve. Individual institutions, facing the situation in the mid-1980's of inability to hire new young Ph.D.'s will undoubtedly want to turn increasingly to devices for opening additional vacancies beyond those made available through normal attrition and retirement. Early retirement schemes, already being talked of for the 1970's, would have special pertinence in the 1980's as a means of avoiding a significant period of inability to add young people to faculty cadres.

Implications of the Analysis for Public Decision-Makers

Public decision-makers--federal and state--have cause to examine carefully the issues discussed in this paper. The most fundamental of these, of course, is the question of basic financing of higher education, either by improvement of the student's ability to finance his higher education or by increases in institutional support from state and federal sources. It is beyond the scope of this paper to address the merits of alternative approaches to higher education finance, but it is clear that the outcome of these debates will affect very substantially the academic

demand for doctorates in the next two decades. Related to the question of financing are two other issues: that of "quality," conventionally approached by weighing the implications of decreasing student-faculty ratios, and the issue of faculty productivity, often approached by exploring ways of increasing student-faculty ratios.

Public decision-makers also have a major stake in the question of support to institutions responsible for conferring the doctorate. Because federal and state actions concerning such support need to be considered jointly with questions of institutional decisions by doctorate-offering universities, we shall discuss the question of governmental policies together with that of institutional decision-making.

Implications of the Analysis for Doctorate-Granting Institutions and for Agencies Supporting Doctoral Education

The present analysis does not purport to cover the total future demand for Ph.D.'s, nor does it provide information concerning the supply and demand conditions in particular fields or disciplines. Wolfle and Kidd summarize and cite various recent studies of demand for Ph.D. scientists in governmental and industrial research and professional employment, a very important component of total demand in some fields.[8]

Academic demand for doctorates has typically accounted for widely differing proportions of the appropriate types of employment made available to new doctorates in different fields--from roughly one-third to one-half, in the hard sciences, to essentially the whole of suitable employment in various specialties in the humanities. Thus, the analysis discussed in this paper should be taken to provide different degrees of definition of future market conditions for new doctorates. (Also, it has not been possible

[8] Wolfle, D. and C. V. Kidd, op.cit.

for anyone, including the present authors, to do much with the question of future student demand for specialized study in various fields, and the influence this may have on the disciplinary composition of academic demand for doctorates.)

What this study does show is that future academic demand for doctorates, without reference to fields of specialization, could vary over a wide range as a function of future policies of higher education finance and future staffing standards and hiring practices of the various types of institutions. If stringent financing conditions prevail in the 1970's, academic demand will be below the level projected in Cartter's study; whereas the demand could, under the revised assumptions we have explored, exceed his estimates by a factor of two or three.

A relatively small number of universities--the AAU member institutions--have historically accounted for approximately two-thirds to three-quarters of doctorates awarded in the United States. These institutions have committed heavy capital and operating resources to the development and operation of doctoral programs. Our analysis shows that the degree of buoyancy of future demand for the educational services at the doctoral level for which these institutions are mainly responsible will be greatly affected by the financing policies of state and federal agencies toward higher education as a whole.

Our analysis also shows quite clearly two other important demand factors:

1) the 1980's, by reason of an expected downturn in higher education enrollments, will be far worse than the 1970's; and

2) the enrollment expansion of the 1970's implies a considerable expansion of total faculty positions in higher education, but the composition of this expansion--weighted toward public

four-year colleges and with an even more substantial growth of two-year colleges--compels re-examination of present patterns of doctoral training for academic careers.

We have not made an independent study of the projections of future supply of doctorates. Wolfle and Kidd summarize and compare various of these. Even the most conservative of them, Cartter's and Froomkin's, show continued growth in the number of doctorates awarded each year throughout the 1970's. It can be assumed that, especially for the first half of the decade, supply pressure for academic employment of doctorates will be intense, even if studies such as Cartter's and this one are taken seriously by decision-makers. This means that the problem of making more academic jobs available to doctorates, and fitting new doctorates properly for them, in terms of both motivation and training, is of high priority for the doctorate-producing institutions.

The Carnegie Commission had recommended that programs leading to a teaching doctorate, in parallel with the traditional research and scholarly orientation of the Ph.D., be widely adopted. The analysis of sectoral demand in Section IV of this paper shows the cogency of this recommendation from the standpoint of many doctoral candidates and of many doctorate-producing institutions. This is one very significant means of expanding the market for those who undergo training for academic careers. The projections made in Section IV, and other evidence, suggest that a substantial opening of positions in two-year colleges is unlikely to be achieved purely by supply pressure on the part of new Ph.D.'s whose training has not been shaped to equip them for the kinds of jobs that will need to be filled on a large scale in this expanding sector.

Implications for Institutions Contemplating the Establishment of New Doctoral Programs and Public Agencies Deciding Whether to Support Them

Manpower forecasting is a notoriously inaccurate business. It is quite possible that all of the current work on both the supply and the demand sides of the doctoral equation will prove in due course to be wrong. For one thing, if the projections now being made and debated are taken seriously, actions will be taken that may invalidate the projections; and, indeed, the projections are partly for the purpose of encouraging the re-examination of policies.

What does seem quite clear, on the basis of present information, is that proposed new doctoral programs should be examined very carefully both by institutions and by funding agencies before they are approved.

Consider the institution that would like to initiate a series of new doctoral programs as soon as it can. As of 1971, it can appoint organizing committees of key faculty to design the content of curriculum. In a year or two a new program could be approved and announced. A trickle of students might be attracted to enroll. Meanwhile, efforts would be made to hire a few "star" faculty to attract other more junior faculty and to serve also as a basis for attracting research funds from extramural sources. Along the way, perhaps at the time the new program is announced, the plans would be firm enough to show that a new building was needed for the program and to commence the planning and the effort to acquire funding for it. Five years after this decision, a new building would actually be on-stream and operating, so that a definite expansion of the doctoral program's enrollment could now occur. But it is now 1978. An enlarged class of new graduate students, entering in that year, would come on the market in 1984, a year of absolutely negative academic demand for new Ph.D.'s--and, they would

all have to wait until 1988 to have a prayer of a chance of an academic position.

Clearly, if this is a trustworthy picture of the future, it would be very unwise for the institution to start, in 1971, with the sequence of efforts and decisions which would produce such a catastrophe for it and its students in the mid-1980's.

Many academic planners and faculty with high aspirations for entry into doctoral training will no doubt react to this as scare talk, but two points are worth keeping in mind. First, Allan Cartter did not invent the decline in the birthrate, and the eighteen year-olds of 1984 are already five years old today, so that what we are talking about--an enrollment decline in the 1980's--would fail to occur only if increases in college participation rates and in duration of education were enough to overcome a quite steep, absolute and known decline in the age-group population of potential college attendance. Second, many existing doctoral programs are small and insecure and should probably expand in order to have more reasonable unit costs and vitality so that the net expansion potential of existing programs is probably an important factor to be considered. As of 1971, if Cartter's work is to be believed, it would be a grave mistake to start conversations about initiating a Ph.D. program in any field for which academic demand for those emerging from the program is the significant factor, unless it can be shown that the field in question or the design of the program exempts it from the bleak pressure of the market that Cartter predicts will obtain. Furthermore, any existing Ph.D. program that is making a claim for a new building or other major resource expansion should, under Cartter's picture of the future, be compelled to produce similar evidence of exemption from average reality.

Implications for Students Who Contemplate Doctoral Preparation for Academic Careers

The prospective doctoral student can draw some lessons from this analysis concerning his prospects of a future academic career if he completes a doctorate. The unusually gifted student who has a vocation for academic life will not and should not be dissuaded from it by any of the data and projections here. What this study does show is that, for the student who has not yet started a doctoral program, the market he or she will face in the early years of an academic career after completing a degree will be difficult--and it is most likely to be most difficult to find a rewarding post in the research-oriented universities. It is likely to be easier if the student would be happy as a teacher and can find a doctoral program that promises to equip him well and put positive effort toward effective placement in a teaching post in a four-year or two-year, publicly supported college.

Finally, the doctorate will in the future turn out to be increasingly a course of training that, as law and engineering have already proved to be, serves as a base for a widening variety of career employments. The student who takes steps to equip himself flexibly for a variety of possible careers will be in a better position to compete for employment than the student who picks a narrow research field and has only that string to his bow.

APPENDIX A

METHOD OF CALCULATION OF STUDENT-FACULTY RATIOS FOR TABLE 2-1

$$\text{Student-Faculty Ratio} = \frac{\text{No. of Full-time Equivalent (FTE) Students}}{\text{No. of Full-time Equivalent (FTE) Faculty}}$$

Calculation of FTE Students

A student is defined as a resident undergraduate, first professional degree, or graduate student enrolled in a course creditable toward a bachelor's or higher degree. Excluded are: extension, correspondence, summer session, and non-degree credit students.

The data report the number of full-time students and the number of part-time students. To obtain the FTE of part-time students, the number of part-time students was multiplied by 0.333. For graduate students, the percentage of total graduate students who were part-time was first calculated in order to obtain the number of full-time and part-time graduate students.

Total FTE Students:

(No. of full-time undergraduate and first professional degree students) + (No. of part-time undergraduate and first professional degree students) (0.333) + (No. of graduate students [head count]) $\left(\frac{\% \text{ part-time}}{100}\right)$ (0.333) + (No. of graduate students [head count]) $\left(\frac{100 - \% \text{ part-time}}{100}\right)$.

Calculation of FTE Faculty

Faculty is defined as senior resident instructional staff (department heads, professors, instructors) for degree-credit courses. Excluded are: teaching and research assistants as well as persons engaged in organized

research.

The Office of Education questionnaire requested institutions to report the FTE of part-time faculty as well as number of full-time faculty.

Total FTE Faculty:

(No. of full-time faculty) + (FTE of part-time faculty) .

The institutions included in our categories are classified as:

Universities: "Institutions which give considerable stress to graduate instruction, which confer advanced degrees as well as bachelor's degrees in a variety of liberal arts fields and which have at least two professional schools that are not exclusively technological." [10]

Four-Year Colleges: Liberal Arts Colleges
Teachers' Colleges
Technological Schools
Theological Schools
Schools of Art
Other Professional Schools

Two-Year Institutions: Institutions which offer two or more years of work but less than a bachelor's degree. (Degree-credit courses)

Calculations for Individual Years

1953 and 1955(1)

The Office of Education questionnaire requested faculty and student data on numbers enrolled in "college-grade" courses. A number of technical institutes (primarily two-year institutions) were included in the 1953 and 1955 figures [1,2]; however, "college-grade" courses did not necessarily mean courses creditable to a bachelor's or higher degree.

For the years 1953 and 1955 (1), separate figures for full-time and part-time graduate students were not available; therefore, these were calculated for the different sectors and types of schools within the sectors individually using percentage distributions for full-time and part-time graduate students given for 1959 [9].

1955(2) and 1957

In 1957, 50 technical institutes that had previously reported enrollment and faculty for "college-grade" courses were reclassified as giving non-degree credit courses [4]. The 1955 data were also reworked to take into account the new classification [3]. This accounts for the discrepancy between 1955(1) and 1955(2) figures. The 1955(2) calculations correspond to the figures for the later years.

For the years 1955(2) and 1957, separate figures for full-time and part-time graduate students were not available; therefore, these were calculated for the different sectors and types of schools within the sectors individually using percentage distributions for full-time and part-time graduate students given for 1959 [9].

1959

[5,8,9]

1961

Enrollment figures for universities and other four-year colleges were grouped together [5]. We were, therefore, unable to calculate student-faculty ratios for our categories.

The percentage distributions of full-time and part-time graduate student enrollments were calculated for 1961 data [7] and found not to vary significantly from those calculated from 1959 data [9]. It was assumed, therefore,

that these percentage distributions were fairly stable and the 1959 figures used in the FTE graduate student calculations for 1953, 1955(1), 1955(2), and 1957 since figures were not available for those years.

1963

Whereas earlier years had grouped undergraduates and first professional degree students together, giving full-time and part-time figures, in 1963, full-time and part-time figures for undergraduates were given while only a head count of first professional degree students was reported [10,11]. Therefore, we used 1967 data [6] to first calculate the percentage of first professional degree students who were part-time and then applied this percentage (calculated for the different sectors and types of schools within the sectors individually) to the total enrollment of first professional degree students in each type of school. Finally this number was multiplied by 0.333 to obtain the FTE of part-time first professional students.

FTE first professional degree students:

$$(\text{No. of first professional degree students}) \left\{\frac{\% \text{ part-time}}{100}\right\} (0.333) + (\text{No. of first professional degree students}) \left\{\frac{100 - \% \text{ part-time}}{100}\right\}.$$

1966 and 1967

The data were simplified [12,13,14,15]. The Office of Education categories were:

Universities
Other four-year institutions
Two-year institutions

The FTE of total full-time and part-time enrollment was given for these years as well as the FTE of part-time faculty.

APPENDIX B

DATA SOURCES USED IN CALCULATING STUDENT-FACULTY RATIOS

[1] Biennial Survey of Education in the United States, 1952-54, "Statistics of Higher Education: Faculty, Students and Degrees, 1953-54," Chapter 4, Section 1, U.S. Office of Education.

Table 2: Faculty, Enrollment and Degrees, by Type and Control of Institution: Aggregate United States, 1953-54.

[2] Biennial Survey of Education in the United States, 1954-56, "Statistics of Higher Education: Faculty, Students and Degrees, 1955-56," Chapter 4, Section 1, U.S. Office of Education.

Table V: Faculty, Students and Degrees, by Type and Control of Institution: Aggregate United States, 1955-56.

[3] Biennial Survey of Education in the United States, 1956-58, "Statistics of Higher Education: Faculty, Students and Degrees, 1957-58," Chapter 4, Section 1, U.S. Office of Education.

Table 11: Faculty and Other Professional Staff, by Type of Position, and Type and Control of Institution: Aggregate U.S., First Term, 1957-58, and Percent Change from November 1955.

[4] Biennial Survey of Education in the United States, 1956-58, "Statistics of Higher Education: Faculty, Students and Degrees, 1957-58," Chapter 4, Section 1, U.S. Office of Education.

Table 21: Students by Type of Enrollment and Type and Control of Institution: Aggregate United States, First Term, 1957-58, and Percent Change from November 1955.

[5] Comprehensive Report on Enrollment in Higher Education, 1961-62, U.S. Office of Education, Circular 743.

[6] Students Enrolled for Advanced Degrees: Part A - Summary Data, Fall 1967, United States National Center for Educational Statistics.

Table 2: Enrollment for First-Professional Degrees in Selected Fields, by Level of Enrollment, Attendance Status, Sex of Student, Level of Institution, and Institutional Control: Aggregate United States, Fall 1967.

[7] Enrollment for Advanced Degrees: Fall 1963, U.S. Office of Education, Circular 786.

Table 12: Enrollment for Advanced Degrees by Level of Study, Attendance, Status, Type of Institution and Institutional Control: Aggregate United States, Fall 1963.

[8] Faculty and Other Professional Staff in Institutions of Higher Education, First Term, 1959-60, U.S. Office of Education, Circular 714.

Table 11: Faculty and Other Professional Staff, by Type of Position, and Control and Type of Institution: Aggregate United States, First Term, 1959-60.

[9] Enrollment for Advanced Degrees, Fall 1960, U.S. Office of Education, Circular 674.

Table 6: Enrollment in Degree Credit Courses in Four Year Institutions by Level, Full-time and Part-time Status, and Type of Institution and Control: Fall 1959.

[10] Resident and Extension Enrollment in Institutions of Higher Education, Fall 1963, Circular 776.

Table 2: Resident and Extension Students in Institutions of Higher Education, by Type of Enrollment, Level and Type of Institution, and Institutional Control: Aggregate United States, Fall 1963.

[11] Faculty and Other Professional Staff in Institutions of Higher Education, First Term, 1963-64, Circular No. 794.

Table 8: Positions for Faculty and Other Professional Staff by Type of Institution, Type of Position, and Institutional Control: Aggregate United States, Fall 1963.

[12] Numbers and Characteristics of Employees in Institutions of Higher Education, Fall 1966.

Table I - B,C,D: Estimated Number of Professional Employees by Control, Employment Status, and Primary Function: Aggregate United States, Fall 1966.

[13] Opening Fall Enrollment in Higher Education, 1966, U.S. Office of Education.

Table 2: Opening Enrollment of Students, by Enrollment Category, Level of Institution, and Institutional Control: Aggregate United States, Fall 1966.

[14] Numbers and Characteristics of Employees in Institutions of Higher Education, Fall 1967.

Table IIB: Professional Employees in Universities, by Control, Employment Status, and Primary Function: Aggregate United States, Fall 1967.

Table IIC: Professional Employees in Other 4-Year Institutions, by Control, Employment Status, and Primary Function: Aggregate United States, Fall 1967.

Table IID: Professional Employees in 2-Year Institutions, by Control, Employment Status, and Primary Function: Aggregate United States, Fall 1967.

[15] Opening Fall Enrollment in Higher Education, 1967, U.S. Office of Education.

Table 2: Opening Enrollment of Students, by Enrollment Category, Level of Institution, and Institutional Control: Aggregate United States, Fall 1967.

TABLE A-1

Resident Instruction and Departmental Research (excluding Organized Research, Library, and other Professional Staff), by Type of Institution, Public and Private, Fall 1967

	All Institutions			Public			Private		
	Full-time	Part-time	FTE*	Full-time	Part-time	FTE*	Full-time	Part-time	FTE*
Senior Staff:	301,459	90,763	31,761	190,199	44,154	15,673	111,260	46,609	16,088
	Universities			Public			Private		
Senior Staff:	127,338	38,923	13,914	86,429	16,680	6,716	40,909	22,243	7,198
	Other 4-Year Institutions			Public			Private		
Senior Staff:	130,777	31,846	11,457	66,522	10,218	3,580	64,255	21,628	7,877
	2-Year Institutions			Public			Private		
Senior Staff:	43,344	19,994	6,390	37,248	17,256	5,377	6,096	2,738	1,013

*Full-time equivalent of part-time.

Source: Numbers and Characteristics of Employees in Institutions of Higher Education, National Center for Educational Statistics, Fall 1967, Tables IIA, IIB, IIC, and IID.

Note: Institutions included were from mailing list of Education Directory, 1966-67, Part 3, Higher Education, plus new schools added. Survey forms were mailed to 2,382 institutions.

TABLE A-2

Opening Enrollment of Students, Fall 1967
Including Full-time and Full-time Equivalent of Part-time Students
[0.333 x Part-time Students]

	Total: Public and Private	Public	Private
All Institutions:	5,440,852	3,724,291	1,716,560
Universities:	2,091,186	1,549,663	541,523
Other 4-Year Institutions:	2,301,252	1,252,216	1,049,035
2-Year Institutions:	1,048,413	922,413	126,001

Source: Opening Fall Enrollment in Higher Education, 1967, Higher Education Studies Branch, Table 2.

Note: Institutions included were from mailing list of Education Directory, 1966-67, Part 3, Higher Education, plus new schools added. Usable reports were obtained from all of the 2,382 institutions in the survey.

PUBLISHED REPORTS

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